Parallel Graph Algorithms: Sandia's Capabilities

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Project hasn't started yet!

Sandia National Laboratories

Sandia's Uniqueness

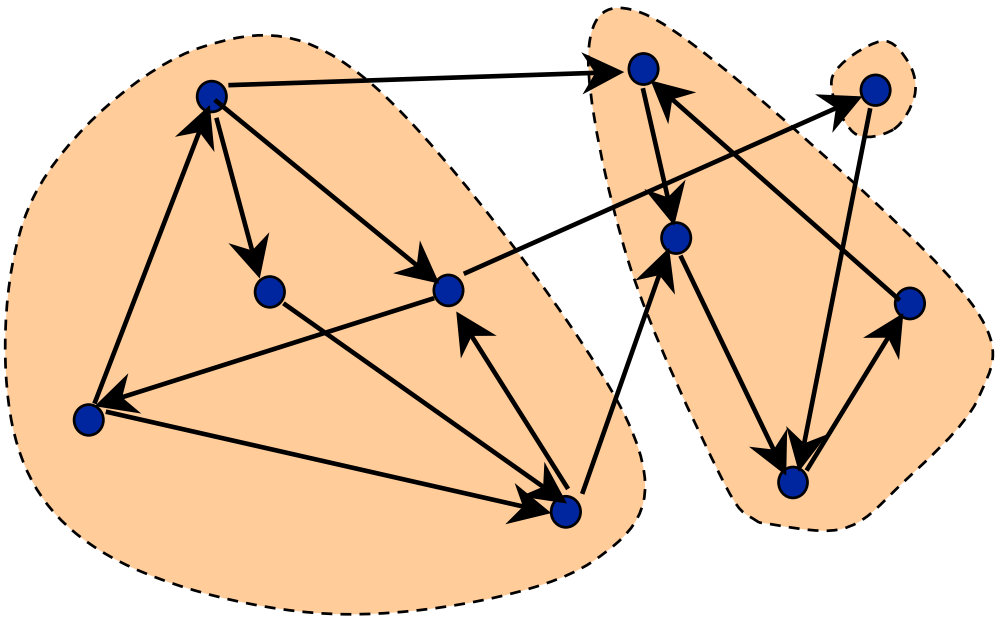
- **Only discrete math department in DOE**
- **Long history of work in**
  - » **Graph algorithms**
  - » **Parallel combinatorial algorithms**
  - » **Load balancing models**
  - » **Software tools & libraries for such problems**

Load Balancing

- **To parallelize, must divide tasks among procs**
- **Naturally phrased as graph partitioning**
  - » **Balance vertices, but cut few edges/hyperedges**
- **Sandia partitioning algorithms and tool (Chaco)**
- **Parallel tool (Zoltan) supports parallel graph algorithms.**
- **Expertise formulating graph models for load-balancing.**

Strongly-Connected Components

- **Fundamental graph decomposition - clustering model.**
- **Sandia developed first parallel algorithm and implementation (SnRAD)**
  - » **Kernel is multi-start breadth-first-search**



FY'04 Plans

- **Integrate Zoltan into Livermore codes**
  - » **Provides graph partition, dynamic load-balancing, data migration**
  - » **Facilitates further parallel development and algorithmic exploration**

- **Out-year plans**
  - » **Work with Livermore on parallel queries**
    - – **Short paths, clustering, motif-finding**